

Abstract of the Disclosure

The invention concerns a system for modulating tissue physiology, for example, to prevent or reverse tissue damage caused by disease. The system utilizes vigilant cells that include stable vectors containing a gene switch/biosensor and a gene amplification system. The

5 vectors allow expression of a transgene (such as a cardioprotective gene) in the vigilant cells to be regulated in response to a physiological signal, to be switched on or off, and to provide sufficient levels of the transgene product to achieve a desired result, *e.g.*, prevention or reversal of myocardial cell damage. In addition to myocardial infarction, the vectors can be used to treat

10 cells in a number of other disease states, including diabetes, cancer, stroke, and atherosclerosis. These approaches to stem cell-based gene therapy provide a novel strategy not only for treatment but for prevention of cell destruction.